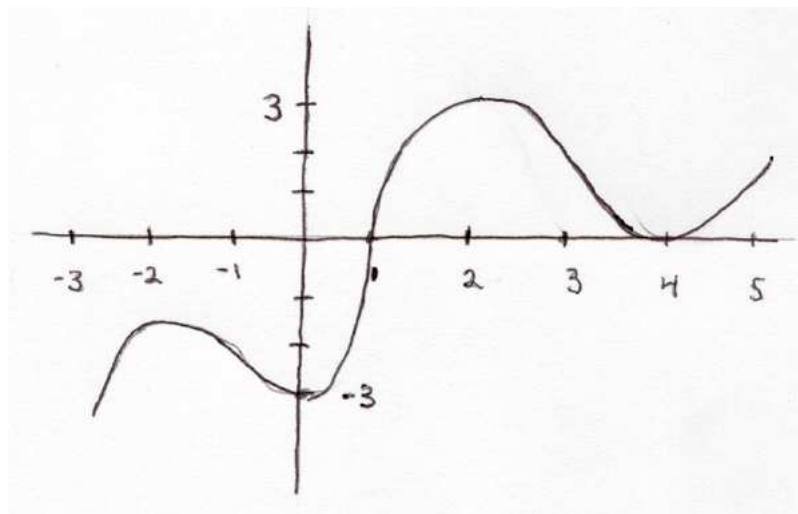


Calculus 1: Practice Exam 1

Name:

- (1) Explain in words why the derivative of the linear function $f(x) = mx + b$ (m and b are fixed real numbers) is $f'(x) = m$.
- (2) Here is a graph of $f(x)$.



- (a) Draw a possible graph for $f'(x)$ (on a new set of axes). Be as accurate as possible.
 - (b) Draw the graph of an antiderivative of $f(x)$ (on a new set of axes). Be as accurate as possible.
- (3) Suppose that for some function $m(x)$, $m'(-3) = 0$ and $m''(-3) = -\frac{2}{5}$. What can you say about the graph of $m(x)$ at $x = -3$. Explain.
 - (4) Explain graphically (in terms of secant lines and tangent lines) why the definition of the derivative of $f(x)$ at $x = a$ is

$$f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$$

- (5) The following limit expresses the derivative of a certain function $h(x)$ at a certain point a . What are the function and the point?

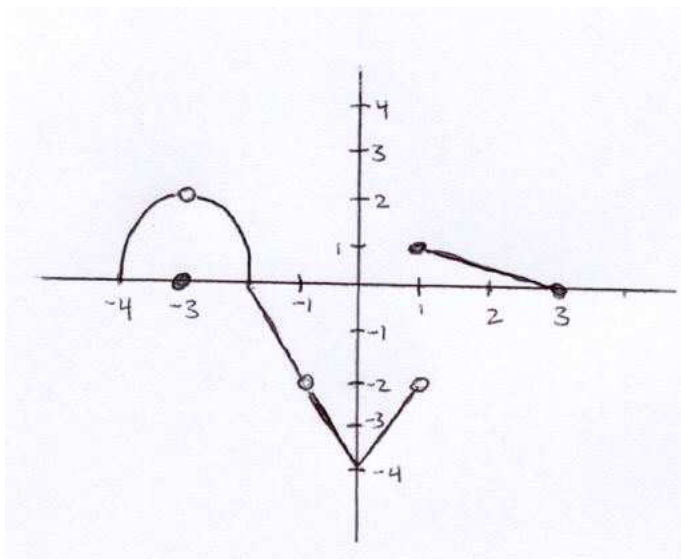
$$\lim_{h \rightarrow 0} \frac{2^3 2^h - 8}{h}$$

- (6) Suppose that k and r are fixed real numbers. Let

$$f(x) = kx^5 - \frac{r}{\sqrt[5]{x^3}} + \sqrt[3]{x^2}$$

Show and explain all your work.

- (a) What is $f'(x)$?
- (b) Find all the antiderivatives for $f(x)$.
- (7) Use the definition of the derivative to find $f'(x)$ if $f(x) = \frac{2}{\sqrt{x-3}}$.
- (8) Here is the graph of a certain function $h(x)$. Find the following limits if they exist. If they do not exist explain why.



- (a) $\lim_{x \rightarrow -3} h(x)$
- (b) $\lim_{x \rightarrow -1} h(x)$
- (c) $\lim_{x \rightarrow 0} h(x)$

(d) $\lim_{x \rightarrow 1} h(x)$

(e) $\lim_{x \rightarrow 1^+} h(x)$

(f) $\lim_{x \rightarrow 1^-} h(x)$

(g) $\lim_{x \rightarrow 3^-} h(x)$

(h) Is $h(x)$ continuous at $x = -3$? Why or why not?

- (9) A region is going to be fenced in with a rectangular fence and then more fence will cut the region into two corrals of equal size. If the fence costs \$25 per foot what dimensions for the sides will maximize area if the total cost is to be \$1000?

- (10) Find two solutions to the differential equation:

$$f''(x) = 2f(x)$$

- (11) Suppose that a is a constant. What is the derivative of $g(x) = e^{-ax}$?